





## Section B - Supplies or Services and Prices

**MULTI SHAKER VIB RATION CONTROL SYSTEM (VCS)****BASIC REQUIREMENT**

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0001		1	Each	\$	\$

In accordance with 2.1 through 2.19 of Statement of Work.

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0002		1	Each	\$	\$

One Year Warranty

In accordance with 2.20 of statement of work.

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0003		1	Each	\$	\$

Training Requirements

In accordance with 2.21 of statement of work.

**OPTIONAL REQUIREMENTS**

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0004		1	Each	\$	\$
	In accordance with 3.1 of statement of work for MIMO control.				

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0005		1	Each	\$	\$
	In accordance with 3.2 of statement of work for MIMO control.				

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0006		1	Each	\$	\$
	In accordance with 3.3 of statement of work for MIMO control.				

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0007	In accordance with 3.4 of statement of work for the VCS.	1	Each	\$	\$

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0008	In accordance with 3.5 of statement of work ten additional analog digital converter (ADC) input channels.	1	Each	\$	\$

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0009	In accordance with 3.6 of statement of work, Two external 36 Gigabyte or greater throughput disk drives shall be supplied to record the time histories for post-test processing and storage.	1	Each	\$	\$

## Section C - Descriptions and Specifications

STATEMENT OF WORK

**STATEMENT OF WORK  
FOR A  
MULTI SHAKER VIBRATION CONTROL SYSTEM (VCS)**

**1. SCOPE.**

This statement of work establishes the functional, performance, and test requirements for a multi shaker vibration control system (VCS). This control system shall be capable of controlling multiple shakers in single axis configuration as well as in multi-axis configurations with control of up to 6 degrees of freedom (DOF) for two independent 6 DOF vibration systems. The controller shall also be capable of controlling a single shaker, work as a data acquisition system and provide analysis during and after testing. The requirements in this statement of work are minimum requirements. Capabilities that meet or exceed these requirements are acceptable.

**2. BASIC REQUIREMENTS.**

2.1 This VCS shall be capable of running multiple input, multiple output (MIMO) and multiple input, single output (MISO) digital shock and vibration tests. The VCS will be used at the Naval Packaging, Storage, Transportation, and Storage (PHST) Center, Naval Surface Warfare Center, Indian Head Division, Detachment Earle, Colts Neck, New Jersey.

2.2 For MIMO control, the VCS must be able to control from two to 12 vibration shakers, moving in the same axis, and provide phase, coherence, and amplitude control for closed loop random, closed loop sine, closed loop random on random, and closed loop sine on random.

2.3 For MIMO control, the VCS shall be capable of controlling two independent 6 DOF vibration machines and provide phase, coherence, and amplitude control for closed loop random, closed loop sine, closed loop random on random, and closed loop sine on random.

2.4 For MISO control, the VCS shall be capable of running closed loop random, closed loop sine, closed loop random on random, and closed loop sine on random.

2.5 The VCS must have the ability of updating the system response matrix every loop to assure true control of non-linear responses that occur during a test to account for dynamic changes in a unit under test (UUT).

2.6 In addition to the MIMO and MISO random on random and sine on random capabilities, a feature to combine these into a true mixed mode test shall be provided (e.g., sweeping narrow band random tones on broadband random with sweeping sine tones running simultaneously).

2.7 The VCS must be able to display *all* control channels, measurement channels, impedance matrix,  $H(f)$  matrix, drive spectra, etc.; simultaneously during the test. In addition, data stored in the systems throughput drive shall be available to analyze posttest.

2.8 For MIMO testing the VCS must provide a method to provide for control of singularities, or control zeros that may exist at particular frequencies while running a test. A control parameter that is adjustable shall be provided to address this.

2.9 For MIMO applications the control system shall be capable of running both random and sinusoidal vibration tests without a separate pre-test characterization (impedance matrix) of the system. The ability to run a separate pre-test characterization at a low level shall also be provided. The pre-test characterization shall be a closed loop test.

2.10 For MIMO applications, the control system shall account for and properly control the complete impedance matrix of all possible input/output combinations. For example, a four-shaker test with four control transducers will require a impedance matrix of 4 X 4 terms that result in a 16-output/input matrix pair of terms. On the other hand, a four-shaker test with seven transducers will require a matrix of 4 X 7 terms that result in 28-output/input impedance matrix pair terms.

2.11 For MIMO application the VCS shall solve the control equation for PSD, phase and coherence simultaneously during each control loop during the test. All three parameters shall be solved together and not separately.

2.12 For MIMO multiple degree of freedom application (e.g., 3 DOF or 6 DOF), the VCS shall provide a software coordinate transformation technique and a method for controlled torsional reduction.

2.13 During a MIMO test, the ability to see changes in the impedance matrix, shall be provided.

2.14 The controller shall provide a method for MIMO testing to switch between test setups that define the system control to be run in a correlated or uncorrelated condition.

2.15 The controller must have output anti-imaging filters on all drive channels to prevent signals from being sent to the shakers that are outside of the vibration test profiles.

2.16 The controller must have the capability to use active auxiliary channels that are not assigned as control channels as limit channels. (All available auxiliary channels shall be capable of this.) The limit channels shall allow a profile definition to control a limit situation. This profile could be different than the test input profile. This will allow a response on a test item to not exceed a predefined limit.

2.17 For all MIMO operations, the VCS must be capable of square and rectangular control strategies. Square control is defined as having the same number of input channels as output channels. (One control transducer for every drive channel.) Rectangular control is defined as having more control channels then output channels. (More control transducers then drive channels.)

2.18 The VCS shall have analysis capabilities that meet the requirements of section 6.

2.19 All power for the VCS should be 110 volts. Surge protector and noise suppression power strips shall be supplied with the VCS.

2.20 One-year warranty added to the end of the standard manufacturer's warranty. This warranty shall include all hardware, software updates and user support.

2.21 Training requirements: A 3-day on-site training on the system will be provided by the contractor within a month following the system's delivery.

### **3. OPTIONAL REQUIREMENTS.**

3.1 For MIMO control, the VCS shall be able to control from two to 12 vibration shakers, moving in the same axis, and provide phase, coherence, and amplitude control for closed loop waveform replication.

3.2 For MIMO control, the VCS shall be capable of controlling two independent

6 DOF vibration machines and provide phase, coherence, and amplitude control for closed loop waveform replication.

3.3 For MISO control, the VCS shall be capable of running closed loop waveform replication, shaker transient waveform (including shock response spectrum (SRS) and classical shock pulse testing for single shaker testing.

3.4 The VCS must have the capability to run in both the MIMO and MISO configuration, profiles that are from time history field data.

3.5 Ten additional analog digital converter (ADC) input channels.

3.6 Two external 36 Gigabyte or greater throughput disk drives shall be supplied to record the time histories for post-test processing and storage.

#### **4. HOST COMPUTER/VIBRATION CONTROL SUBSYSTEM REQUIREMENTS.**

**4.1 Workstation computer (host).** The host shall be a high performance UNIX workstation or equivalent. The host shall function as the operator interface to the vibration control subsystem via a high-speed digital link. The host shall incorporate:

- a. A 70 gigabyte or larger and 7200 RPM or faster hard drive (2 smaller capacity disk drives may be substituted as long as the capacity is 70 gigabyte or larger)
- b. A 4 gigabyte or larger RAM Memory
- c. A 1 megabyte or larger Cache memory
- d. 64-Bit processor
- e. A 21-inch or larger liquid crystal display (LCD) display
- f. A digital video disk/compact disc (DVD/CD-ROM) drive
- g. A CD-writer drive
- h. Small Computer System Interface (SCSI)
- i. At least two Ethernet connections
- j. At least 5 USB ports
- k. Support at least 36 input channels and 16 output channels for MIMO applications. Must be capable of support up to 96 input channels for future expansion.
- l. The host shall have full windowing capability. m. A smart card reader.

**4.2 DSP/matrix compute capability.** The VCS shall incorporate sufficient floating point computational capability to optimally perform the necessary Digital Signal Processor (DSP) and matrix processing required for full closed loop real time control of two 6 DOF vibration test systems.

**4.3 Hardcopy device.** The system shall come with a color postscript hardcopy printer.

**4.4 Terminal and printer location.** The system terminal and printer shall be housed on an existing computer desk located in the Naval PHST Center.

**4.5 Vibration control subsystem hardware.**

4.5.1 The vibration control subsystem hardware shall be set up, initialized, and operated from a host computer via a high-speed data link. The host computer provides the operator interface and may or may not participate directly in the control loop.

4.5.2 The vibration control subsystem shall consist of instrument quality hardware designed to provide adequate cooling for all internal components operating at 100% duty cycle, provide adequate power for maximum component configuration specified herein. It shall incorporate sufficient noise isolation/suppression to permit the Analog to Digital Converters (ADC's) and Digital to Analog Converters (DAC's) to operate with an internal (grounded inputs and outputs) noise floor of 90 dB below full scale. Hardware shall include power supply for integral electronic sensors for a minimum of 36 measurement channels, operating simultaneously. The input channels shall also be capable of taking conditioned voltage signals that are not integral electronic type sensors. The system shall be upgradable to 92 input channels for future expansion.

4.5.3 Vibration control subsystem hardware and software shall be designed/selected to minimize latency in the control loop. Latency in this context is the time it takes to acquire enough data to process an update to the control outputs, perform the necessary processing, and output the resultant drive signals. In order to achieve minimum latency the system shall provide the fastest possible movement of the data from the ADC's to the vibration control subsystem's processors, very fast processing, and very fast output through the DAC's. This must be accomplished via Real Time Adaptive Control (RTAC), which is defined as a closed loop control that updates its system response model estimate at every control loop iteration to minimize errors arising from the use of an improper frequency response.

4.5.4 The vibration control subsystem hardware shall be developed and supported by the same vibration controller supplier.

**4.6 Analog input and output.**

4.6.1 The vibration control subsystem shall include hardware modules for anti-alias filtering of the data, digitizing analog signals, spectral computations for control loop processing, and generation of a compensated shaker drive signal.

4.6.2 The input channel hardware shall be capable of sampling up to 36 channels of data simultaneously. The input channel hardware shall meet or exceed the following requirements:

a. ADC for each input channel capable of acquiring data at a maximum frequency of 40 kHz. For the 40 kHz frequency (which will be required for shock testing) the sampling rate shall exceed the nyquist criteria and be in excess of 100,000 samples per sec.

b. Each ADC shall provide at least 16 bits of resolution and be coupled to a programmable 16-bit or greater attenuator that shall be under program control, ensuring automatic dynamic ranging of front end.

c. Each ADC shall be capable of continuous input auto ranging during both sine and random vibration testing.

d. Zero-to-peak full-scale voltage ranges shall be selectable by the control software from 55 mV to 10 V with at least 10 selectable ranges.

- e. Measurement dynamic range of at least 90 dB on each channel, verifiable by a two-tone test (non-harmonic tones).
- f. For shaker control applications, anti-aliasing filters shall be programmable in at least 9 frequency ranges from 50 to 20 kHz.
- g. The anti-aliasing filters shall have at least 90 dB of stop-band attenuation and, above 1.56 times the cutoff frequency, a guard-band roll-off of at least 120 dB/octave.
- h. The ripple in the pass band of the anti-aliasing filters shall be a maximum of + 0.15 dB from DC to 90% of the cutoff frequency.
- i. The amplitude match between channels shall be within + 0.25 dB while the phase difference between channels shall not exceed  $\pm 1$  degree from 0 Hz to 20 kHz and  $\pm 2$  degrees above 20 to 40 kHz.
- j. Cross talk between channels shall not exceed 90 dB below full scale.
- k. Channel calibration procedures shall be available for automatic calibration without the need for potentiometer adjustments.
- l. Selection of AC or DC signal coupling shall be available.
- m. Capability to switch from a displacement transducer control transducer to an accelerometer signal transducer within the same test profile (if needed for low frequency displacement profiles) shall be provided.
- n. Power for low impedance piezoelectric (ICP type) accelerometers shall be supplied.

4.6.3 The output channel hardware shall be capable of generating 12 high fidelity, low distortion, and analog voltage signals capable of driving electro-dynamic or hydraulic shakers. The output channel hardware shall meet the following requirements:

- a. Each DAC shall provide at least 16 bits of resolution, be coupled to a programmable 16-bit attenuator, and be supported with at least 64 Kbytes of on-board memory.
- b. Cross talk between channels shall not exceed 90 dB below full scale.
- c. Each output channel shall be capable of an output rate as high as 50,000 samples per second.
- d. The output frequency bandwidths for vibration control shall be selectable from 50 to 20 kHz with at least 9 frequency ranges.
- e. Each output signal shall be capable of driving at least 100 feet of shielded coaxial 50-ohm cable without the need for external amplification when the other end of the cable is connected to the input of a power amplifier with at least 100 K-ohm of input impedance.
- f. Digital Anti-imaging filters combined with analog smoothing filters after the D/A conversion must be included in each output channel.
- g. Each output channel shall include smoothing filters with at least 80 dB of stop band attenuation at 1.56 times the cutoff frequency, and a pass band ripple not exceeding  $\pm 0.15$  dB.

#### **4.7 VCS operating system/utility software.**

**4.7.1 General requirements.** The host vibration workstation shall operate with a stable and reliable operating system. The operating system used shall be designed for 64 bit high performance computing.

**4.7.2 A Real Time Operating System (RTOS)** shall support the VCS. The RTOS shall be the operating system that handles the vibration control feedback loop for real-time closed-loop control applications such as sine and random vibration testing (no operator in the loop). It shall be able to update its system response in closed loop at every control loop iteration to minimize errors arising from the use of improper frequency response. It shall be highly deterministic and shall have very low latency interrupt servicing that guarantees absolute control of the vibration test equipment and responds very quickly to external fault inputs. The RTOS may reside on either the host or the vibration control subsystem.

**4.7.3 Calibration requirements.** The system shall include software calibration routines that require no manual adjustments of the electronics, and shall provide calibration capability with the calibration traceable to National Institute of Standards and Technology (NIST) standards. At a minimum, these routines shall provide calibration of the DAC's, ADC's, filters, and other applicable components in the system. This routine shall provide a interactive mode of operation that leads the operator through a step by step calibration routine by providing operator oriented prompts, accepting credible inputs, and reporting system actions. Calibration, not simply verification of calibration, must be accomplished.

**4.7.4 Diagnostic routines.** The system shall include diagnostic routines that shall provide basic trouble shooting capability. At a minimum, these routines shall provide diagnostic examination of the CPU, coprocessors, DSP processors, RAM, ROM, DAC's, ADC's, disk drives, hardcopy device and system terminal. This routine shall provide a conversational mode of operation that leads the operator through a step by step diagnostic routine by providing operator oriented prompts, accepting credible inputs, and reporting system actions.

**4.7.5 Data conversion.** All vibration and shock data shall be able to be converted from the contractors' proprietary format to ASCII, UFF and MatLab format using simple pull-down menus.

## **5. VIBRATION CONTROL SOFTWARE.**

**5.1 General information.** All VCS software shall be designed to facilitate test setup, execution and data reduction. The software shall be designed for ease of maintenance and supportability. All control software used in the VCS shall be developed and supported by the vibration control supplier.

**5.1.1 Shaker configurations.** Single shaker, multiple shakers single axis, and multiple shakers two axis, three axis and 6 DOF testing shall be supported. Shaker configurations with up to twelve exciters shall be supported simultaneously for all vibration types specified below.

**5.1.1.1** The control system shall use closed loop control to control a single electrodynamic shaker or multiple electro-dynamic shakers in either single axis or multiple axis configurations.

**5.1.1.2** Control of any multi-shaker configuration shall provide synchronization, phase control, and suppression of interactions between shakers (cross talk). Suppressing interactions between shakers shall include appropriate measures to ensure that no spectral points exceed the tolerances established by the reference for each shaker.

**5.1.1.3** Software backup copies: The system shall include backup copies of all system software on CD-ROM.

## **5.2 Performance.**

**5.2.1 Input/output.** The system shall acquire data on all input channels simultaneously and output data on all output channels simultaneously on a sustained basis at a rate of 40,000 samples/second per channel or higher.

**5.2.2 Power Spectral Density (PSD) computations.** The system shall analyze random data (PSD computation) acquired at a Nyquist Criterion (i.e. the sample rate shall be greater than twice the highest frequency of the input) on all ADC input channels simultaneously in real time with at least 1 Hz resolution for a frequency band of 1 to 2000 Hz. Real time in this context means that the ADC's operate continuously and all data digitized is used in the analysis.

**5.2.3 Sine data reduction.** While controlling, sine analysis of response measurements shall be made with Fundamental processing; utilizing either fixed digital tracking filters or proportional digital tracking filters (both shall be provided). The sample rate shall never be less than 4 times the frequency of interest. Data shall be displayed in peak g vs. frequency in either broadband or fundamental mode, allowing users to see filtered and unfiltered results at will. All available measurement channels shall be displayed at will simultaneously in the formats noted.

### **5.3 Mode of operation.**

#### **5.3.1 Operator interface.**

5.3.1.1 The VCS shall be controlled through the host system terminal. The system shall provide a graphical user interface that allows the operator to enter, view, and edit the test parameters.

5.3.1.2 The operator interfaces for the various types of vibration control and data analysis shall differ only as required by test type. Common parameters shall be displayed in the same order, screen formats shall be similar, and menu formats shall be common.

5.3.1.3 The system shall provide single key (function key) inputs for test start, test abort, level changes, stop, return to setup etc. These essential functions shall be displayed on a command line at the top or bottom of the terminal screen at all times. Essential function displays shall only show and the system shall only respond to those functions that are applicable to the current mode (e.g. equalization, ready for test, execution etc.).

#### **5.3.2 Test setup.**

5.3.2.1 Inputting a new test setup or editing an existing setup shall be implemented using a screen editing approach. When entering a new setup, reasonable default values shall be displayed. The operator shall be able to select any entry for update by positioning the cursor to that entry via the keyboard or a mouse. Context sensitive help must be available without leaving the setup field.

5.3.2.2 The vibration control software shall be completely self-contained. Once the operator initiates vibration control he shall be able to setup, equalize, view data, execute tests, analyze data, and generate post-test plots without returning to the operating system.

**5.4 Equalization.** The system shall measure the vibration system transfer function(s), and synthesize the required drive signal(s) automatically after being started from the system terminal. Equalization must be done at various gain levels as gain is stepped up. The system must be able to equalize at each level before increasing gain.

**5.5 Standard engineering units.** Data items and test parameters shall be expressed in a consistent set of standard engineering units. Graphs/plots, terminal display, etc. shall be clearly labeled as to the units employed. Both metric and U.S. standard units shall be supported.

**5.6 Functions.** As a minimum, the following functions shall be available to the operator:

#### **5.6.1 Setup.**

5.6.1.1 Provide a method for specifying test parameters by loading an existing setup from disk, modifying an existing setup, or inputting a new setup from the terminal keyboard.

5.6.1.2 Provide a method for inputting reference profiles with accompanying tolerances.

5.6.1.3 Provide a database of existing vibration test systems that incorporates:

- a. Number of exciters
- b. Force rating of exciters
- c. Maximum displacement
- d. Maximum velocity
- e. Phase relationships of multi-shaker configurations

**5.6.2 Test execution.** Allows a test to be executed. As a minimum, the following functions shall be available to the operator:

**5.6.2.1 Equalization.** Starts the shaker table/controller equalization process.

**5.6.2.2 Test: Initiates test execution.**

**5.6.2.2.1 Test execution monitoring.** During test execution the reference, the upper and lower tolerances, test level, and the control data for each control channel shall be displayed on the system terminal in graphic format. Each control channel shall be displayed as a separate plot. Drive signals, phase, and coherence (for multiple shaker configurations) shall be displayed on separate plots. Any selected response channels shall be viewed real-time during the test with active cursors for all spectra. Test Level and elapsed time shall be displayed prominently enough to be read from four feet away when viewed as a single display on the screen. The displays shall be updated as the test progresses. For transient tests, the displays shall be updated after each transient is output. The domain shall be consistent with test type (e.g. PSD for random, Gpk for sine, and time history or SRS for transient). The operator shall be able to make a hardcopy of the screen display at any time during test execution.

**5.6.2.2.2 Abort.** Causes test to be stopped without any transient overshoots. After an abort, the system shall wait for operator input.

**5.6.2.2.3 Continue.** Resumes test after an abort (at the point of abort).

**5.6.2.2.4 Resume.** Sets system up to rerun the random and shock tests. There should be an option to either re-start these tests with or without the need to reequalize via the operator selection of either using a previously stored set of drive signals or not. Swept sine tests can also be resumed, but due to safety issues, the drive is brought up smoothly – at the frequency at which the test is interrupted – to the corresponding test level. Restart shall be effective after an abort or a normal end of test.

**5.6.2.2.5 Change test level.** Permits the operator to specify a new test level. The new level shall be specified in dB or percent relative to the test profiles.

**5.6.3 Status indication.** The following minimum status information shall be available to the operator; ready for test, equalization, test in progress, test complete, and test abort. The above status indications may be incorporated into a command line.

**5.6.4 Data recall.** The following minimum data shall be available for display and

plotting. These signals shall be available for display and plotting anytime after the signals are synthesized or measured:

- a. Reference signals.
- b. Controls and composite control as measured by the control accelerometer(s).
- c. Drive signals (Spectral display for random and sine, time history and SRS for shock).
- d. Transfer functions.
- e. Response data from all available measurement channels. Channels used for control or limiting should also have response data available for viewing, just as during live testing.
- f. Post test plots: composite plot of reference, control(s) and tolerances. The user shall be able to select auto plotting so that report quality printer copies of all displayed plots are automatically generated at test completion.

### 5.7 Test setup.

**5.7.1 Setup input.** The system shall be capable of loading a previously prepared test setup from disk storage. The system shall also provide a means of generating and editing test parameters. Input parameters for a test setup shall include but not be limited to:

- a. Test title
- b. Test annotation
- c. Test system
- d. Shaker phase relationships for multi-shaker configurations
- e. Number of control points (minimum of one per shaker)
- f. Input channel functions: Control, limit, analysis, or inactive
- g. Identification labels of at least 32 alphanumeric characters for each input channel
- h. ADC sensitivities in mV/g for each input channel
- i. AC/DC/ICP coupling for each input channel
- j. Minimum and maximum frequencies
- k. Abort limits  $\pm$  and Alarm Limits are specified in terms of  $\pm$  dB.
- l. Profile definitions (test criteria)

**5.7.2 Test specific parameters.** Additional setup parameters peculiar to the various types of vibration tests are detailed in their respective sections.

**5.7.3 Test system database.** It shall be possible to define and edit system level shaker limit tables that can be easily accessed and used by any application program test setup. Each application program shall cross check the test reference dynamic limits against the selected shaker limits and prohibit test execution if any shaker limit parameter would be exceeded.

**5.7.4 Edit capability.**

5.7.4.1 The system shall allow the operator to change an existing test setup by modifying any parameter or other input that is part of an initial test setup.

5.7.4.2 The system shall include the ability to edit individual breakpoints of a test reference profile without having to sequentially step through the entire profile. Operator changes  $g^2/\text{Hz}$  breakpoints for random and Gpk breakpoints for sine and transient.

5.7.4.3 The system shall permit single entry modification to the selected reference in random, sine and shock so that a new reference level with all pre-existing conditions remaining constant shall be invoked for the test; i.e. random shall permit a new Grms value and maintain the reference shape, sine shall permit a dB value from  $-30$  to  $0$  with reference remaining the same and shock shall accept a new  $g$  level, keeping all other parameters constant.

**5.7.5 Saving setups.** The system shall permit the operator to save test setups. The software shall prompt for a pathname/filename any time the software is exited or another test is selected. Number of setups saved shall be limited only by available disk space.

**5.7.6 Saving test data.** The system shall automatically save all test vibration data. This data shall include all control data, reference signals, response data, transfer functions and any other data required to rerun the tests without re-equalizing.

**5.8 Run log.** A run log function shall be provided that allows the system to generate a text file that records all application messages, such as test level changes, alarms, abort, etc., and operator commands occurring during the test.

**5.9 System control.**

**5.9.1 Dynamic range.** The system shall control a dynamic range of greater than  $90$  dB in amplitude at any given ADC sensitivity.

**5.9.2 Frequency range.** The frequency shall be controlled from  $1$  Hz to at least  $3000$  Hz for random and sine testing. Transients shall be controlled from  $1$  Hz to at least  $5000$  Hz.

**5.9.3 Control bandwidth.** The control bandwidths shall be selectable up to  $5000$  Hz minimum for transient waveform tests and  $3000$  Hz minimum for other test types. The system shall automatically set the filters to values appropriate for the control bandwidth selected.

**5.9.4 Sample rates.** The VCS software shall control the DAC and ADC sample rates. Minimum sample rates shall be at least  $2.56$  times the maximum frequency specified for vibration testing and  $10$  times the maximum frequency specified for shock testing.

**5.9.5 Measurement channels.** All ADC Input channels shall be available for measurement channels. Data acquired by these channels shall be analyzed in the same manner as control and limit channels. They shall be monitored for ADC overload only. If an ADC overload is detected on a measurement channel, the operator shall be warned but the test shall not be aborted.

**5.9.6 Control methods.**

5.9.6.1 The system shall allow for both single and multi-shaker applications.

5.9.6.2 Control of any multi-shaker and/or multi-axis configuration shall permit the operator to specify a test profile for each axis at any point on the shaker table, fixture, or test article. The test setup shall specify the ADC input channel associated with this point for each axis.

5.9.6.3 For all MIMO applications, the VCS must be capable of square and rectangular control strategies. Square control is defined as having the same number of input channels as output channels. (One control transducer for every drive channel.) Rectangular control is defined as having more control channels than output channels. (More control transducers than drive channels.)

5.9.6.4 It shall be possible to associate a unique reference profile to each control response channel.

5.9.6.5 It shall be possible to associate a unique reference profile with several (or all) control response channels.

#### **5.9.6.6 Averaging.**

**5.9.6.6.1 For single shaker control.** The system shall average the selected control signals for each amplitude profile. Averaging in this context means arithmetic averaging of the responses of all control channels in a given axis.

**5.9.6.6.2 For multiple shaker control.** The capability of using more inputs than outputs shall be provided which will allow the multiple inputs to provide an average control. A traditional square control method shall also be provided.

#### **5.9.6.7 Extremes.**

**5.9.6.7.1 For single shaker control.** Control based on the maximum PSD value at each line of all specified control channels.

**5.9.6.7.2 For multi-shaker control.** Maximum limiting shall be accomplished by defining measurement channels to be also used as limit channels.

#### **5.10 Protection.**

**5.10.1 Automatic abort.** The VCS shall automatically shut down the shaker system being controlled to protect it and the test item from damage or out-of-tolerance conditions. It shall do this by quickly decreasing all output levels to zero in a smooth manner. The error source and cause of the shutdown shall be prominently displayed on the terminal screen and entered into the run log. The following is a minimum list of conditions to be monitored. The system shall abort if any of these conditions are detected:

- a. Loss of control signal (ADC channel open): The system shall automatically detect a loss of signal on any control or limit channel.
- b. Allow selected measurement channels to function as limit channels. User may define a spectrum to be discretely applied to each limit channel that shall govern, spectral line by spectral line, the absolute maximum g peak or  $g^2/\text{Hz}$  values across the active spectral limits of the limit channel that the test article may be allowed to experience. Number of limit channels shall be as many as the system has available for measurement purposes up to the maximum number of 36. Limit channel decision-making overrides the control spectrum decision-making in the control scheme. User must be able to elect to enable the limit channel operation at levels below 0 dB. Limit value shall not be re-scaled to the scaled down reference associated with this choice.
- c. Limit: All control channel acceleration responses in a given axis are below the lower limits specified in the test setup. Active at full level only. At lower levels, the system shall warn the operator if an out of tolerance condition occurs. The basic algorithm for a control system must handle this function, which is to always drive hard

enough to meet the specified responses. The exception is when one or more limit levels are exceeded. In this case, for multi-shaker control, the overall reference vector is attenuated, within the range of frequencies for which the respective limit spectra are exceeded, thus reducing the system's overall response such that the limit channel's response is less than or equal to its respective limit profile, within the affected range of frequencies.

d. **DAC output overload:** At all output levels below full level the system shall compute the peak output voltages required for control at full test level. If any output voltage level exceeds the maximum output voltage available from the DAC, the system shall abort the test. If a synthesized drive signal exceeds the maximum DAC output level, the system shall abort the test.

**5.10.2 Manual abort.** The operator shall be able to initiate a smooth shutdown of any test via a single key input from the system terminal or from an external switch. If a test is aborted for any reason, the operator shall have the option of continuing at the point of abort, restarting the test, or terminating the test. In the case of a mission simulation with multiple events, the operator shall also have the option of proceeding to the next event.

**5.10.3 Zeroing DAC outputs.** The system shall automatically ground or hold the DAC outputs to zero volts at all times when a signal is not being output.

**5.10.4 ADC overloads.** At completion of a setup the system shall compute the maximum voltages required to achieve the maximum acceleration levels specified in the setup. If any voltage exceeds 80% of the ADC's maximum voltage for a particular voltage range, the system shall auto-range to the next higher voltage range until the over-range condition is alleviated. Similarly, if any voltage falls below 20% of the ADC's full-scale voltage for a particular voltage range, the system shall auto-range to the next lower voltage range until the under-range condition is alleviated. In the event that the ADC over-range cannot be alleviated – the input voltage exceeds 10 Volts peak – then the system shall warn the operator and abort the test if the condition persists.

**5.10.5 Invalid output.** The system shall protect against invalid output. Whenever a change is made to the test profile that would invalidate the reference, transfer function, or drive data, that data shall not be usable for test execution. If the operator attempts to plot invalid data, the system shall display a warning of the invalid condition. Example: changing number of lines in a random test setup, changing frequency band, etc.

**5.11 MIMO and MISO Random vibration control software.** This section presents the specifications that are unique to random vibration control.

**5.11.1 Test setup inputs.** This section details test setup inputs required for setting up a Random test. These inputs are in addition to the standard inputs detailed in section 5.7.

**5.11.1.1 Reference spectrum shaping.** The operator shall be able to specify the reference PSD spectra shall in terms of either slope (dB/octave) or the breakpoint frequencies or in PSD levels ( $g^2/Hz$ ) and the breakpoint frequencies. (Both shall be provided) Spectrum breakpoint shall include the upper and lower tolerances in dB. The system shall allow for up to 100 breakpoints for each of the shakers simultaneously. The PSD energy may start and/or terminate at any frequency from 1 to 3000 Hz.

**5.11.1.2 Random Control Energy.** The random control shall generate true nonperiodic random energy to conform to MIL-STD-810F.

**5.11.1.3 External file input.** The system shall also input a reference spectrum from a data file consisting of PSD's, cross spectra and/or coherence data computed using the data acquisition and analysis functions specified in section 6 (operator selectable).

**5.11.1.4 Dynamic range.** The system shall accept and control minimum and maximum amplitudes in a reference spectrum having a dynamic range of at least

45 dB. This does not include the additional dynamic range needed to compensate for the excitation system's distortion, noise and other extraneous effects.

**5.11.1.5 Clipping.** The operator shall be able to specify a sigma clipping level for the drive outputs. Values in the drive signal greater than the sigma level shall be set to the sigma value if clipping is selected. Sigma is the ratio of the peak value to the rms value of the shaker drive signal.

**5.11.1.6 Test schedule.** The system shall permit the operator to specify a test schedule consisting of amplitude steps vs. time. The system shall automatically execute this schedule.

**5.11.1.7 Step levels.** shall be specified in terms of Grms or dB relative to full level (0 dB = 20 Log for Grms). Full level test duration shall be selectable from 3 seconds to at least 24 hours.

**5.11.1.8 Abort Levels.** The operator shall be able to select whether or not the system will abort at each test level. If the system is not able to control any of the control accelerometer responses to within the specified tolerances within the scheduled time at any test level the operator shall be warned and the programmed step changes shall be executed.

**5.11.2 Manual mode.** Manual mode shall permit the operator to override the test schedule. The system shall provide single key command inputs for:

- a. Raising the test level to the next higher step in the test schedule.
- b. Lowering the test level to the next lower step in the test schedule.
- c. Holding the current level - not allow the next programmed step change.
- d. Resuming the test schedule after a hold.

**5.11.3 Alarm limit.** The alarm limit shall be selectable in dB or as a percentage of the abort limits. When an alarm limit is exceeded, the system shall adjust the feedback loop parameters to increase the convergence rate.

**5.11.4 Rms abort limit.** The Rms abort limit shall be specified in dB and represents the allowable deviation between the Grms level of the reference profile and the Grms level of the control PSD. Rms level shall be computed across the bandwidth specified in the test setup.

**5.11.5 Feedback loop.** Random control feedback loops shall operate on a 100% real time basis. During the averaging portion, the system shall complete all operations on the previous blocks of data digitized while the current blocks are being acquired. Use of multiple control channels shall not degrade the control loop time. Methods shall be provided for the operator to select a loop time (indirectly) by directly selecting the parameters that affect the accuracy of amplitude measurement (e.g. error at the 90% confidence level vs. statistical DOF, frequency resolution and range, etc.)

**5.11.6 Limit channels.** The system shall permit the operator to select any of the ADC input channels as limit channels. A limit channel shall limit the  $g^2/Hz$  amplitude to a frequency/amplitude profile specified in the test setup by the operator. For multiple shaker operations, the system shall measure the contribution of each shaker to the response at the limit location and adjust the drives to each shaker accordingly. Limit profiles shall be defined using up to 40 frequency breakpoints.

**5.11.7 Abort criteria.** The system shall abort the test if any of the following conditions exist:

**5.11.7.1** The Grms level of an input control exceeds its respective 0 dB reference Grms by greater than the specified rms abort limit.

**5.11.7.2 Limit plus:** At any level when a full level (0 dB) line abort criteria specified in the test setup is exceeded.

**5.11.8 Frequency resolution.** The system shall permit the operator to specify the number of lines of resolution for a given test profile. The system shall provide as a minimum the choice of 100, 200, 400, 800, 1600, or 3200 lines of resolution over a maximum bandwidth of 3000 Hz.

**5.11.9 Coherence.** The system shall control the level of coherence between each and every pair of shakers. For the purpose of this statement of work, this means that the control system shall be able to effect increased coupling or decoupling as required to effect the desired level of coherence between each pair of shakers. The system shall be able to force at least 95% coherence between all shaker pairs that are aligned on a common axis for frequencies below 100 Hz. The system shall enable the operator to specify the desired level of coherence as a function of frequency between each and every pair of shakers (e.g. in a x number of shaker systems there would be x number coherence profiles required). Coherence between shakers shall be specified in terms of a spectrum via as many as 100 breakpoints. Coherence values shall range from 0.0 to 0.99 in increments of 0.01. Coherence profiles shall be part of each multi-shaker random test setup.

**5.11.10 Control accuracy.** The system shall generate true multi-dimensional random compliant with MIL-STD test guidelines. The system shall control the random vibration to within 0.5 dB of the specified Grms level. The system shall control each filter bandwidth in each auto (PSD) and cross-spectral response to within  $\pm 1.0$  dB with 120 DOF and with 90% confidence for the case of a flat transfer function. The system shall directly control the relative phase and coherence between shakers. The system must decouple shakers from each other to ensure accuracy of test and proper relationship of shaker generated energy.

**5.12 MIMO and MISO Sine vibration control software.** This section presents the specifications unique to Sine vibration control. Sine vibration shall be accomplished using real time feedback control.

**5.12.1 Setup.** The following inputs are specific to sine testing and are in addition to the setup entries detailed in section 5.7.

**5.12.1.1 Sweep mode.** The sweep mode input shall allow the operator to select a linear sweep, log sweep, or sine dwell. Signal generation must be analog quality so that shaker table and test article experience a seamless transition from start frequency to final frequency of the test. The range shall be at least 1 Hz to 2000 Hz.

**5.12.1.1.1** If a linear sweep is selected the system shall prompt the operator to select either the sweep time in minutes or the sweep rate in Hz per minute. If the sweep time is specified the system shall compute and display the sweep rate. If the sweep rate is specified the system shall compute and display the sweep time. If a log sweep is selected, the system shall prompt the operator to select either the sweep time or the

sweep rate in octaves per minute. If sweep time is selected the system shall compute and display the sweep rate in octaves per minute. If sweep rate is specified, the system shall compute and display the sweep time.

**5.12.1.1.2** If a sine dwell is selected, the system shall prompt the operator for the frequency and time duration. The system shall provide the capability to track a dwell based on phase shift of 90° between response and table input. The system shall be able to dwell at multiple frequencies and then drop output during the frequency change. Needed to test to MIL-STD-648 and MIL-STD-810 requirements.

**5.12.1.2 Reference spectra.** The system shall permit reference spectra to be input in terms of displacement, velocity, or acceleration. The system shall permit at least 100 segments to be defined for reference spectrum and shall permit choices of segment definition to be constant displacement, velocity, acceleration, straight line acceleration - linear or log. The system shall automatically compute and display the other two values (e.g. if the point is specified in displacement the system shall display the peak velocity and acceleration values). Abort limits in dB shall be selectable for each segment of the reference. For multi-axis operation, a separate reference spectrum shall be specified for each axis.

**5.12.1.2.1** The amplitude of the sine sweep between breakpoints shall be linearized in reference to the respective breakpoint amplitudes. In other words, the breakpoint frequency-amplitude points shall be connected by straight-line segments on a log-log basis for log sweeps, and on a linear-linear basis for linear sweeps for determining amplitudes vs. frequency between breakpoints.

**5.12.1.2.2** If a sine dwell is selected, the system shall prompt for frequencies and amplitudes in Gpk rather than a reference spectrum.

**5.12.1.3 Measurement method.** The system shall allow the operator to select the measurement method to be used on control channel data as well as measurement channels at user discretion. Options shall be:

- a. Peak amplitude based on broadband sampling of the control response signal
- b. Rms filter processing with a selection of at least 10 choices for integration time periods proportional to the drive frequency
- c. Tracking Filter Processing: control on fundamental (driven) frequency only, for all channels in parallel. This method is required for MIMO sine control channels.

**5.12.1.3.1 Tracking Filter Processing.**

- a. Tracking filters must be actual filters generated digitally to achieve greater than 60 dB rejection of out of band signals. Fast Fourier Transform (FFT) based windowing is not an acceptable substitute.
- b. All channels shall permit digital tracking filter operation in parallel.
- c. Ability to control with various means such as proportional to drive frequency and fixed bandwidth.
- d. Each contractor is required to supply a plot showing its tracking filter attenuation characteristics for review. The plots shall be of a 40% proportional band width with a center frequency of 100 Hz. The plots shall be in a log amplitude vs. linear frequency format. The frequency scale shall be from 1 to 200 Hz for this plot. The amplitude scale shall be from .00001 to 10 Gpk.

**5.12.1.4 Limit channels.**

5.12.1.4.1 All channels not employed, as control channels should be available to perform limiting operation. The system shall permit the operator to select any of the ADC input channels as limit channels. A limit channel shall limit the amplitude of the sweep to a frequency/amplitude profile specified in the test setup by the operator. For multiple shaker operations the system shall measure the contribution of each shaker to the response at the limit location and adjust the drives to each shaker accordingly. Limit levels shall be specified in volts, Gpk, or general engineering units that are consistent with the defined control reference spectrum.

**5.12.1.5 Sweep direction and starting frequency.** This parameter specifies if the initial sweep direction is increasing or decreasing, in addition to starting frequency.

**5.12.1.5.1** Sweep mode shall be selectable to linear, logarithmic, or integer.

**5.12.1.5.2** Sweep range shall be selectable between at least 1 Hz and 2000 Hz.

5.12.1.5.3 Sweep resolution shall be selectable between at least 400 to 2000 points per sweep.

5.12.1.5.4 Sweep duration shall be user defined.

**5.12.1.6 Number of single sweeps.** This parameter determines how many times the system shall automatically sweep between the minimum and maximum frequency endpoints specified in the setup. The sweep direction shall reverse each time the low or high frequency is reached. The first sweep is counted in the number of single sweeps even when it does not start at the low or high frequency limits. Data from each sweep shall be automatically saved at the end of the sweep.

**5.12.2 Test duration.** The actual test duration shall be computed by multiplying the total number of single sweeps by the sweep time. If the test is not started at the minimum or maximum frequency, the test duration shall be adjusted to account for the partial sweep duration. Test duration shall be displayed on the system terminal at the completion of the setup phase.

**5.12.3 Display format.** Sine data shall be displayed in Gpk vs. frequency for sine sweeps and Gpk vs. time for sine dwells.

**5.12.4 Manual control.** The system shall permit the operator to enable or disable manual control. Manual Control when enabled shall provide the operator the following.

- a. Hold: Hold the current frequency and amplitude
- b. Resume: Resume the sweep after Hold
- c. Reverse: Change sweep direction

**5.12.5 Status indicators.** In addition to the items detailed in section 5.7.1, the system shall display the current frequency being output, the elapsed time, and the sweep number during sine test execution. The composite display shall be initialized with the reference and tolerances only. The control data shall be added as the sweep progresses. For multiple sweeps this process shall be repeated for each sweep.

**5.12.6 Performance.** The system shall perform sinusoidal vibration control with the following specifications:

**5.12.6.1 Harmonic components.** Harmonic distortion shall be less than -80 dB at the DAC output at full-scale output.

**5.12.6.2 Control accuracy.** Wire to wire phase accuracy shall be at least  $\pm 2^\circ$  at a sweep rate of 1 Oct/min for control with 2 and up to 12 control channels and each channel using an internal 40% proportional bandwidth digital tracking filter. The sweep frequency resolution shall be at least  $\pm 0.5\%$  of the specified drive frequencies over the entire sweep range.

**5.12.6.3 Phase and amplitude control.** With a test item spanning 2 to 12 shakers, the controller shall be capable of controlling the phase and amplitude of the shakers and hold the phase and amplitude to within  $\pm 5^\circ$  and  $\pm 5\%$  when compared to one reference shaker and the required test profile up to 50 Hz. For frequencies greater than 50 Hz the phase and amplitude shall be held to  $\pm 10^\circ$  and  $\pm 10\%$ . Some exceptions to this may be taken at small frequency bands since mechanical feedback from test articles may make this higher frequency phase control difficult.

**5.12.6.4 Signal requirements.**

5.12.6.4.1 The minimum input signal required for control shall be no more than the greatest of 3 mV rms or 6 dB above the ambient noise level.

5.12.6.4.2 The system shall provide sweeping sinusoidal signals with frequency steps of  $0.0001 \times$  current frequency or smaller.

5.12.6.4.3 The system shall output a 1 V peak Constant Output Level Amplitude (COLA) signal with the same frequency and phase as the first output channel drive signal.

### **5.13 Random on random for MIMO and MISO application.**

**5.13.1 Broadband random.** The broadband random shall meet the specifications outlined in section 5.11.

**5.13.2 Narrow-band random definition.** The narrow bands shall be definable either as multiple-line bands or single-line bands. A band as used here refers to a single filter bandwidth of the broadband random signal. Narrow bands shall be defined as constant acceleration in  $g^2/Hz$  or peak  $g$  and true random or pseudo-random.

**5.13.3 Number of narrow-band randoms.** The system shall superimpose up to 30 narrow-band random signals on a broadband random signal for MISO applications and 10 narrow-band random signals on a broadband random signal for MIMO applications.

**5.13.4 Narrow-band random superimposed.** The narrow-band random signals shall be superimposed on the broadband random in either a sum of spectra or maximum of spectra combination.

**5.13.5 Narrow-band random sweep.** The system shall be able to sweep the narrowband random signals across the frequency band of the broadband random.

5.13.5.1 The sweep rates shall be defined in Hz per second or octaves per minute. The system shall permit the operator to input the number of sweeps, the initial sweep direction and frequency, and the frequency band(s) to be swept as part of the test setup.

**5.13.6 Narrow-band random cycling.** The system shall automatically turn the narrow-band randoms on and off. Turn on and turn off shall be in terms of operator specified number of control loops on and number of loops off. This feature shall be operator selectable and shall include an initial start time and a stop time for each band. Start and stop times shall be relative to start of test.

### **5.14 Sine on random for MIMO and MISO Application.**

**5.14.1 Broadband random.** The broadband random shall be as defined in and shall meet the specifications outlined in section 5.11.

**5.14.2 Number of sines.** The system shall superimpose up to ten swept sines on a broadband random signal in addition to at least 30 narrowband random bands for MISO applications. For MIMO applications the VCS shall superimpose up to 5 swept sines on a broadband random signal in addition to at least 10 narrowband random bands.

**5.14.3 Sine levels.** The sines shall be superimposed on the broadband random as a maximum Gpk level. Frequency band, start frequency, initial sweep direction, sweep rate, and levels of each sine shall be individually defined.

**5.14.4 Sine sweeps.** The system shall be able to sweep the sines across the frequency band of the broadband random. Initial frequencies, sweep band(s) frequency limits, and initial sweep direction shall be operator selectable.

**5.14.5 Sweep rates.** The sweep rates shall be defined as either Hz per second or Octaves per minute.

**5.14.6 Sine cycling.** The system shall automatically turn the sines on and off. Turn on and turn off shall be in terms of operator specified number of cycles on and number of cycles off. This feature shall be operator selectable and shall include a start time and stop time for each band. Start and stop times shall be relative to the start of the test

**5.15 MIMO and MISO waveform replication software.**

**5.15.1 Mission profile.** A mission profile is a sequence of one or more events that simulates the operating vibration environment of a test article. Such a profile consists of a sequence of vibration events that may include sine, random, random on random, sine on random, transient waveforms, and periods of no input over the mission time period. MIMO control system shall have the ability for mission profile testing by direct input of vibration events or be accomplished utilizing waveform replication where the different excitation events are imported into the replication file and output as part of the waveform.

**5.15.2 Length.** The system shall be capable of replicating time history waveforms of arbitrary length (limited to hard disk storage capacity).

**5.15.3 Accuracy.** The system shall replicate any achievable waveform to within +1.0 dB of the respective reference waveforms peak amplitude over 90% of the waveform at all control points. The remaining 10% of the replicated waveform shall not exceed +3 dB of the respective reference waveforms peak amplitude ( $\text{dB}=20 \log A$  for Grms).

**5.15.4 File formats.** The system shall enable the operator to input waveform time histories in ASCII file formats or use the time histories captured with the data acquisition capability of the system. Both shall be provided.

**5.16 MISO transient waveform control software.** This section details the specifications that are peculiar to transient waveform testing. For the purposes of this document, a transient waveform is any non-stationary time history signal of up to three seconds duration. It includes but is not limited to the classical shock pulses, built up (shock spectrum) transients, and field measured transients. The system shall have similar cross-coupling compensation, frequency response matrix updating and coherence smoothing to accurately and quickly compensate for non-linearity's or time varying changes in the dynamic load. All control channel responses shall be capable of being controlled to the same reference waveform.

**5.16.1 Setup.**

**5.16.1.1 Transient type.** The system shall permit the operator to select one of the transient types described in section 5.16. If shock spectrum is selected, the system shall prompt the operator for the required parameters to specify the pulse. If a classical waveform is selected the system shall prompt the operator to input the peak g by axis and the duration in milliseconds from a minimum of 0.1ms.

**5.16.1.2 Classical shock waveform synthesis.** The system shall synthesize the following waveforms:

- a. Half sine
- b. Rectangular
- c. Terminal peak saw tooth
- d. Trapezoidal
- e. Triangular
- f. Initial peak saw tooth
- g. Import reference (ASCII formatted data)

**5.16.1.3 Shock spectrum.** The system shall synthesize a reference waveform for each shaker that conforms to an operator specified shock spectrum. The shock spectrum shall be defined in terms of a composite (maximax) spectrum using 1/N octave spacing where N is any integer value from 1 to 12. The desired shock spectrum

shall be specified in frequency vs. spectral g. The system shall synthesize transient waveforms over a frequency range from 2 to 2500 Hz.

- a. All inputs required to define a shock spectrum reference waveform shall be retained as part of the setup for future display and editing.
- b. Synthesis methods shall include sum of decaying sinusoids, wavelets. Fast Sine Sweep (FSS) is not acceptable since it does not produce a transient, but simply fills the SRS with energy; misleading the analyst into thinking a transient occurred.
- c. Reference profiles: The reference profile shall be composed of frequency amplitude breakpoints in the shock spectrum domain. The system shall allow a minimum of 40 breakpoints/axis to define the shock spectrum.
- d. Breakpoint values shall be input, stored and output as part of the test setup.

**5.16.1.4 External waveform.** The operator shall be able to enter an arbitrary transient reference waveform by referencing an external data file.

**5.16.1.5 Waveform conditioning.** Pre- and post-waveform conditioning (operator selectable,) shall be available on all waveforms to optimize the vibrator displacement capability.

**5.16.2 Plotting formats.** The system shall plot the reference, drive, and control waveforms for each axis in either time domain or shock spectrum as specified by the operator.

### **5.16.3 Test input modifications.**

**5.16.3.1 Change the test level.** Changes shall be specified in dB or percent relative to the input profiles or peak g.

### **5.16.3.2 SRS transients.**

**5.16.3.2.1 Shock spectrum editing.** The system shall permit the operator to edit the shock spectrum breakpoints, and then synthesize new drive signals. These changes shall not affect the profiles or tolerances setup in the test setup phase. This feature allows the operator to modify the drives to improve the SRS responses relative to the desired spectrum.

**5.16.3.3 Manual control.** The operator shall be able to execute the following functions during test:

- a. Change test level: increase (decrease) output level to the next (previous) programmed step.
- b. Stop: stop the test sequence and wait for operator direction
- c. Resume: proceed with the test from the point where it was stopped.

**5.16.3.4 Transfer function update.** The system shall provide the operator the option of using synthesized pulses to equalize the system. The system shall also update the system transfer functions during test execution after each operator-specified number of pulses.

### **5.17 Data Acquisition Capability.**

5.17.1 The VCS shall also function as a 36-channel data acquisition system.

5.17.2 The data acquisition capture requirements shall meet the requirements in section 4.6.2.

5.17.3 The data captured using the data acquisition shall be capable of being analyzed with the analysis capabilities defined in section 6.0.

5.17.4 Anti-aliasing filters shall be included and should automatically be configured to prevent aliased signals. The system shall include both analog and digital antialiasing filters.

5.17.5 The data acquisition shall be capable of being both manually activated and configured to activate based on a trigger signal.

## **6. SIGNAL ANALYSIS CAPABILITY.**

**6.1 Swept sine analysis.** The VCS shall have the capability to analyze sine test data from recorded time history data. This time history data set will include a COLA signal channel. The data will be from both the time histories stored on the throughput disk or captured with the systems data acquisition utility. Sine analysis of response measurements shall be made with fundamental processing; utilizing either fixed digital tracking filters or proportional digital tracking filters (both shall be provided). Data shall be displayed in peak g vs. Frequency in either broadband or fundamental mode, allowing users to see filtered and unfiltered results at will. Real time swept sine analysis (while a sine test is running) shall also be provided.

**6.2 Frequency domain analysis.** The VCS shall have the capability to analyze vibration and shock data and provide plots in the frequency domain and include but not be limited to, PSD, frequency response function, fast fourier transform, coherence, cross spectrum, phase, etc.

**6.3 Spectral lines shall be adjustable.** The analysis shall be capable of functioning both for real time data and on post-captured data.

**6.4 Response domain analysis.** The VCS shall have the capability to produce SRS including maxi-max, primary positive and negative, and residual positive and negative. The damping factor and octave spacing should be adjustable. The capability to display a reference line for tolerance/allowable shall be provided.

**6.5 Time domain analysis.** The VCS shall have the capability to analyze shock and vibration data and provide plots in the time domain and include but not be limited to integration, dc removal, filtering, signal manipulation, etc.

## **7. VIBRATION CONTROL INSTALLATION/OPERATION REQUIREMENTS.**

**7.1 Documentation.** The system shall be delivered with at least two complete sets of comprehensive documentation on all major hardware and software components. This documentation shall include:

7.1.1 Operation manuals for each control system software.

7.1.2 Maintenance manuals for all delivered hardware, including sections on planned preventive maintenance if applicable.

7.1.3 Installation instructions for all delivered hardware and software.

7.1.4 Manuals shall include adjustment sections, parts lists and recommended spare parts lists, and clear pictures, drawings, electrical connections, electrical schematics (wiring diagrams), or parts layout and identification of components as applicable to off-the-shelf VCS.

### **7.2 Checkout and acceptance.**

7.2.1 Delivery shall be within 90 days from contract acceptance.

7.2.2 The contractor will perform the installation at Building C-54, Naval PHST Center, Weapons Station Earle, Colts Neck NJ, facility, such that the system is operational. All electrical connections will be provided and performed by the PHST center. All people providing the installation and acceptance tests at Weapons Station Earle must be U.S. citizens or hold permanent residence status.

## Section E - Inspection and Acceptance

## CLAUSES INCORPORATED BY FULL TEXT

**IHD 47 - INSPECTION AND ACCEPTANCE TIMEFRAME (NAVSEA/IHD) FEB 2000**

Inspection and acceptance of supplies to be furnished under this contract shall be made by the Government within **60** days after receipt of material. Payment will be tendered not later than 30 days after acceptance has occurred.

## INSPECTION AND ACCEPTANCE TERMS

Supplies/services will be inspected/accepted at:

CLIN	INSPECT AT	INSPECT BY	ACCEPT AT	ACCEPT BY
0001	Government	Government	Government	Government
0002	Government	Government	Government	Government
0003	Government	Government	Government	Government
0004	Government	Government	Government	Government
0005	Government	Government	Government	Government
0006	Government	Government	Government	Government
0007	Government	Government	Government	Government
0008	Government	Government	Government	Government
0009	Government	Government	Government	Government

## CLAUSES INCORPORATED BY REFERENCE

52.246-2

Inspection Of Supplies--Fixed Price

AUG 1996

## Section F - Deliveries or Performance

## DELIVERY INFORMATION

CLIN	DELIVERY DATE	QUANTITY	SHIP TO ADDRESS	UIC
0001	90 dys. ADC	1	NSWC IHDIV DETACHMENT EARLE RICHARD CELLARY CODE 7123 PHST CENTER C-54, 201 HW COLTS NECK MD 07722-5023 FOB: Destination	
0002	90 dys. ADC	1	(SAME AS PREVIOUS LOCATION) FOB: Destination	
0003	90 dys. ADC	1	(SAME AS PREVIOUS LOCATION) FOB: Destination	
0004	90 dys. ADC	1	N/A FOB: Destination	
0005	90 dys. ADC	1	N/A FOB: Destination	
0006	90 dys. ADC	1	N/A FOB: Destination	
0007	90 dys. ADC	1	N/A FOB: Destination	
0008	90 dys. ADC	1	N/A FOB: Destination	
0009	90 dys. ADC	1	N/A FOB: Destination	

## Section G - Contract Administration Data

## CLAUSES INCORPORATED BY FULL TEXT

**IHD 76 - INDIAN HEAD DIVISION, NAVAL SEA SYSTEMS COMMAND, HOURS OF OPERATION AND HOLIDAY SCHEDULE (NAVSEA/IHD) APR 2005**

1. The policy of this station is to schedule periods of reduced operations or shutdown during holiday periods. Deliveries will not be accepted on Saturdays, Sundays or Holidays except as specifically requested by the Naval Sea Systems Command. All goods or services attempted to be delivered on a Saturday, Sunday or Holiday without specific instructions from the Contracting Officer or a duly appointed representative will be returned to the contractor at their expense with no cost or liability to the U.S. Government.

2. The following days are scheduled holidays for Indian Head Division, Naval Sea Systems Command.

New Year's Day  
 Birthday of Martin Luther King, Jr.  
 Washington's Birthday  
 Memorial Day  
 Independence Day  
 Labor Day  
 Columbus Day  
 Veterans Day  
 Thanksgiving Day  
 Christmas Day

Generally, if the holiday falls on a Saturday, it will be observed the preceding Friday, and if the holiday falls on a Sunday, the observance will be on the following Monday.

For a specific calendar year, the actual date of observance for each of the above holidays may be obtained from the OPM website at OPM.GOV or by using the following direct link: <http://www.opm.gov/fedhol/index.asp>.

3. The hours of operation for the Procurement Department and Receiving Branch are as follows:

<b><u>AREA</u></b>	<b><u>FROM</u></b>	<b><u>TO</u></b>
Procurement Dept. (BLDG. 1558)	7:30 A.M.	4:00 P.M.
Receiving Branch (BLDG. 116)	7:30 A.M.	11:00 A.M.
	12:30 P.M.	2:00 P.M.

If you intend to visit the Procurement Department, please call for an appointment at least 24 hours in advance.

## Section I - Contract Clauses

## CLAUSES INCORPORATED BY REFERENCE

52.204-7	Central Contractor Registration	OCT 2003
52.228-5	Insurance - Work On A Government Installation	JAN 1997
52.229-3	Federal, State And Local Taxes	APR 2003
52.232-1	Payments	APR 1984
52.232-33	Payment by Electronic Funds Transfer--Central Contractor Registration	OCT 2003
52.249-1	Termination For Convenience Of The Government (Fixed Price) (Short Form)	APR 1984
52.249-8	Default (Fixed-Price Supply & Service)	APR 1984

Section J - List of Documents, Exhibits and Other Attachments

1. Relevant Experience Matrix Attachment (1)
2. Past Performance Matrix Attachment (2)
3. Past Performance Questionnaire Attachment (3)

**RELEVANT EXPERIENCE MATRIX**  
**MULTI SHAKER VIBRATION CONTROL SYSTEM (VCS)**

<b>References:</b>	General MIMO Vibration	General MISO Vibration	Rectangular MIMO Control	6 degree of freedom Control

REFERENCES COLUMN SHOULD INCLUDE GOVERNMENT ACTIVITY/ COMPANY NAME, ADDRESS, POC AND TELEPHONE NUMBER, FAX NUMBER AND EMAIL ADDRESS. CURRENT POC INFORMATION SHOULD BE PROVIDED TO FACILITATE THE EVALUATION PROCESS.

**KEY:**

P - INDICATES OFFEROR WAS A PRIME CONTRACTOR - (attach list of any subcontractors and their involvement)

S - INDICATES OFFEROR WAS A SUBCONTRACTOR - (attach list of the prime contractors customer POC)

**Attachment (1)**

**Past Performance Matrix**

<b>References</b>	<b>\$ Value of Contract</b>	<b>Work Description</b>	<b>Contract Completed on Time YES / NO</b>	<b>Contract Completed at Cost YES / NO (if no % of overrun)</b>	<b>Provide Explanation for NO answers</b>

References column should include government activity/ company name, address, POC and telephone number.

**Attachment (2)**

## PAST PERFORMANCE QUESTIONNAIRE COVER SHEET

FOR SOLICITATION NUMBER N00174-\_\_\_\_\_

Name of offeror questionnaire is being completed for: \_\_\_\_\_

\*\*\*\*\*

Name of agency/activity completing questionnaire: \_\_\_\_\_

Name and title of the person completing questionnaire: \_\_\_\_\_

Length of time your agency/activity has been involved with the offeror: \_\_\_\_\_

SUBMIT PAST PERFORMANCE QUESTIONNAIRE BY 15 Aug 2005

TO:

Naval Surface Warfare Center

101 Strauss Avenue, Bldg. 1558

Indian Head, MD 20640-5035

**Kay Proctor**, Contract Specialist, Code 111W \_\_\_\_\_e-mail address: [kay.proctor@navy.mil](mailto:kay.proctor@navy.mil)

\*\*\*\*\*

## RATING SCALE

Please use the following ratings to answer the questions.

## EVALUATION CRITERIA

Excellent - The offeror's performance was consistently superior. The contractual performance was accomplished with minor problems, to which corrective action taken by the contractor was highly effective.

Good - The offeror's performance was better than average. The contractual performance was accomplished with some minor problems, to which corrective actions taken by the contractor were effective. They would be willing to do business with the offeror again.

Average - The offeror's performance was adequate. The contractual performance reflects a problem, to which the contractor has not yet identified corrective actions. Consideration would take part in awarding a contract to the offeror again.

Poor - The offeror's performance was entirely inadequate. The contractual performance of the element being assessed contains problems, to which the contractor's corrective actions appear to be or were ineffective. They would not do business with the offeror again under any circumstances.

N/A - The contractual performance of the element being assessed was never a requirement, never an issue, or there is no knowledge of the element in question.

**Attachment (3)**

[illegible]

## CUSTOMER SATISFACTION

The referenced contractor was responsive to the customer's needs.

The contractor's personnel were qualified to meet the requirements.

The contractor's ability to accurately estimate cost.

## TIMELINESS

The contractor's ability to ensure, to the extent of its responsibility, that all tasks were completed within the requested time frame.

## TECHNICAL SUCCESS

The contractor has a clear understanding of the tasks detailed in the SOW and/or delivery orders.

The contractor's ability to complete tasks correctly the first time.

The contractor's ability to resolve problems.

## PROGRAM MANAGEMENT

Did the contractor successfully manage its subcontractors?

Was the contractor's management effective in controlling cost, schedule and performance requirements?

QUALITY

The contractor's quality and reliability of services delivered.

PLEASE PROVIDE SUBJECTIVE RESPONSES FOR THE FOLLOWING:

1. Would you recommend this contractor for similar Government contracts? Please explain:
2. Have you experienced special or unique problems with the referenced contractor that the Government should be aware of in making our decision?

## Section K - Representations, Certifications and Other Statements of Offerors

## CLAUSES INCORPORATED BY REFERENCE

52.204-6                      Data Universal Numbering System (DUNS) Number                      OCT 2003

## CLAUSES INCORPORATED BY FULL TEXT

## 52.212-3    OFFEROR REPRESENTATIONS AND CERTIFICATIONS--COMMERCIAL ITEMS (MAR 2005)

An offeror shall complete only paragraph (j) of this provision if the offeror has completed the annual representations and certifications electronically at <http://orca.bpn.gov>. If an offeror has not completed the annual representations and certifications electronically at the ORCA website, the offeror shall complete only paragraphs (b) through (i) of this provision.

(a) Definitions. As used in this provision:

"Emerging small business" means a small business concern whose size is no greater than 50 percent of the numerical size standard for the NAICS code designated.

"Forced or indentured child labor" means all work or service-

(1) Exacted from any person under the age of 18 under the menace of any penalty for its nonperformance and for which the worker does not offer himself voluntarily; or

(2) Performed by any person under the age of 18 pursuant to a contract the enforcement of which can be accomplished by process or penalties.

Service-disabled veteran-owned small business concern--

(1) Means a small business concern--

(i) Not less than 51 percent of which is owned by one or more service-disabled veterans or, in the case of any publicly owned business, not less than 51 percent of the stock of which is owned by one or more service-disabled veterans; and

(ii) The management and daily business operations of which are controlled by one or more service-disabled veterans or, in the case of a service-disabled veteran with permanent and severe disability, the spouse or permanent caregiver of such veteran.

(2) Service-disabled veteran means a veteran, as defined in 38 U.S.C. 101(2), with a disability that is service-connected, as defined in 38 U.S.C. 101(16).

"Small business concern" means a concern, including its affiliates, that is independently owned and operated, not dominant in the field of operation in which it is bidding on Government contracts, and qualified as a small business under the criteria in 13 CFR Part 121 and size standards in this solicitation.

Veteran-owned small business concern means a small business concern--

(1) Not less than 51 percent of which is owned by one or more veterans (as defined at 38 U.S.C. 101(2)) or, in the case of any publicly owned business, not less than 51 percent of the stock of which is owned by one or more veterans; and

(2) The management and daily business operations of which are controlled by one or more veterans.

"Women-owned small business concern" means a small business concern--

(1) That is at least 51 percent owned by one or more women or, in the case of any publicly owned business, at least 51 percent of its stock is owned by one or more women; or

(2) Whose management and daily business operations are controlled by one or more women.

"Women-owned business concern" means a concern which is at least 51 percent owned by one or more women; or in the case of any publicly owned business, at least 51 percent of the stock of which is owned by one or more women; and whose management and daily business operations are controlled by one or more women.

(b) Taxpayer Identification Number (TIN) (26 U.S.C. 6109, 31 U.S.C. 7701). (Not applicable if the offeror is required to provide this information to a central contractor registration database to be eligible for award.)

(1) All offerors must submit the information required in paragraphs (b)(3) through (b)(5) of this provision to comply with debt collection requirements of 31 U.S.C. 7701(c) and 3325(d), reporting requirements of 26 U.S.C. 6041, 6041A, and 6050M, and implementing regulations issued by the Internal Revenue Service (IRS).

(2) The TIN may be used by the Government to collect and report on any delinquent amounts arising out of the offeror's relationship with the Government (31 U.S.C. 7701(c)(3)). If the resulting contract is subject to the payment reporting requirements described in FAR 4.904, the TIN provided hereunder may be matched with IRS records to verify the accuracy of the offeror's TIN.

(3) Taxpayer Identification Number (TIN).

\_\_\_ TIN:-----

\_\_\_ TIN has been applied for.

\_\_\_ TIN is not required because:

\_\_\_ Offeror is a nonresident alien, foreign corporation, or foreign partnership that does not have income effectively connected with the conduct of a trade or business in the United States and does not have an office or place of business or a fiscal paying agent in the United States;

Offeror is an agency or instrumentality of a foreign government;

\_\_\_ Offeror is an agency or instrumentality of the Federal Government.

(4) Type of organization.

\_\_\_ Sole proprietorship;

\_\_\_ Partnership;

\_\_\_ Corporate entity (not tax-exempt);

- \_\_\_ Corporate entity (tax-exempt);
- \_\_\_ Government entity (Federal, State, or local);
- \_\_\_ Foreign government;
- \_\_\_ International organization per 26 CFR 1.6049-4;
- \_\_\_ Other-----

(5) Common parent.

\_\_\_ Offeror is not owned or controlled by a common parent;

\_\_\_ Name and TIN of common parent:

Name-----

TIN-----

(c) Offerors must complete the following representations when the resulting contract will be performed in the United States or its outlying areas. Check all that apply.

(1) Small business concern. The offeror represents as part of its offer that it ( ) is, ( ) is not a small business concern.

(2) Veteran-owned small business concern. (Complete only if the offeror represented itself as a small business concern in paragraph (c)(1) of this provision.) The offeror represents as part of its offer that it ( ) is, ( ) is not a veteran-owned small business concern.

(3) Service-disabled veteran-owned small business concern. (Complete only if the offeror represented itself as a veteran-owned small business concern in paragraph (c)(2) of this provision.) The offeror represents as part of its offer that it ( ) is, ( ) is not a service-disabled veteran-owned small business concern.

(4) Small disadvantaged business concern. (Complete only if the offeror represented itself as a small business concern in paragraph (c)(1) of this provision.) The offeror represents, for general statistical purposes, that it ( ) is, ( ) is not a small disadvantaged business concern as defined in 13 CFR 124.1002.

(5) Women-owned small business concern. (Complete only if the offeror represented itself as a small business concern in paragraph (c)(1) of this provision.) The offeror represents that it ( ) is, ( ) is not a women-owned small business concern.

Note: Complete paragraphs (c)(6) and (c)(7) only if this solicitation is expected to exceed the simplified acquisition threshold.

(6) Women-owned business concern (other than small business concern). (Complete only if the offeror is a women-owned business concern and did not represent itself as a small business concern in paragraph (c)(1) of this provision.) The offeror represents that it ( ) is, a women-owned business concern.

(7) Tie bid priority for labor surplus area concerns. If this is an invitation for bid, small business offerors may identify the labor surplus areas in which costs to be incurred on account of manufacturing or production (by offeror or first-tier subcontractors) amount to more than 50 percent of the contract price:

-----

(8) Small Business Size for the Small Business Competitiveness Demonstration Program and for the Targeted Industry Categories under the Small Business Competitiveness Demonstration Program. (Complete only if the offeror has represented itself to be a small business concern under the size standards for this solicitation.)

(i) (Complete only for solicitations indicated in an addendum as being set-aside for emerging small businesses in one of the designated industry groups (DIGs).) The offeror represents as part of its offer that it ( ) is, ( ) is not an emerging small business.

(ii) (Complete only for solicitations indicated in an addendum as being for one of the targeted industry categories (TICs) or designated industry groups (DIGs).) Offeror represents as follows:

(A) Offeror's number of employees for the past 12 months (check the Employees column if size standard stated in the solicitation is expressed in terms of number of employees); or

(B) Offeror's average annual gross revenue for the last 3 fiscal years (check the Average Annual Gross Number of Revenues column if size standard stated in the solicitation is expressed in terms of annual receipts).

(Check one of the following):

Average Annual

Number of Employees Gross Revenues

\_\_\_ 50 or fewer \_\_\_ \$1 million or less

\_\_\_ 51 - 100 \_\_\_ \$1,000,001 - \$2 million

\_\_\_ 101 - 250 \_\_\_ \$2,000,001 - \$3.5 million

\_\_\_ 251 - 500 \_\_\_ \$3,500,001 - \$5 million

\_\_\_ 501 - 750 \_\_\_ \$5,000,001 - \$10 million

\_\_\_ 751 - 1,000 \_\_\_ \$10,000,001 - \$17 million

\_\_\_ Over 1,000 \_\_\_ Over \$17 million

(9) (Complete only if the solicitation contains the clause at FAR 52.219-23, Notice of Price Evaluation Adjustment for Small Disadvantaged Business Concerns or FAR 52.219-25, Small Disadvantaged Business Participation Program-Disadvantaged Status and Reporting, and the offeror desires a benefit based on its disadvantaged status.)

(i) General. The offeror represents that either--

(A) It ( ) is, ( ) is not certified by the Small Business Administration as a small disadvantaged business concern and identified, on the date of this representation, as a certified small disadvantaged business concern in the database maintained by the Small Business Administration (PRO-Net), and that no material change in disadvantaged ownership and control has occurred since its certification, and, where the concern is owned by one or more individuals claiming disadvantaged status, the net worth of each individual upon whom the certification is based does not exceed \$750,000 after taking into account the applicable exclusions set forth at 13 CFR 124.104(c)(2); or

(B) It ( ) has, ( ) has not submitted a completed application to the Small Business Administration or a Private Certifier to be certified as a small disadvantaged business concern in accordance with 13 CFR 124, Subpart B, and a

decision on that application is pending, and that no material change in disadvantaged ownership and control has occurred since its application was submitted.

(ii) Joint Ventures under the Price Evaluation Adjustment for Small Disadvantaged Business Concerns. The offeror represents, as part of its offer, that it is a joint venture that complies with the requirements in 13 CFR 124.1002(f) and that the representation in paragraph (c)(9)(i) of this provision is accurate for the small disadvantaged business concern that is participating in the joint venture. (The offeror shall enter the name of the small disadvantaged business concern that is participating in the joint venture: \_\_\_\_\_.)

(10) HUBZone small business concern. (Complete only if the offeror represented itself as a small business concern in paragraph (c)(1) of this provision.) The offeror represents, as part of its offer, that--

(i) It ( ) is, ( ) is not a HUBZone small business concern listed, on the date of this representation, on the List of Qualified HUBZone Small Business Concerns maintained by the Small Business Administration, and no material change in ownership and control, principal office, or HUBZone employee percentage has occurred since it was certified by the Small Business Administration in accordance with 13 CFR part 126; and

(ii) It ( ) is, ( ) is not a joint venture that complies with the requirements of 13 CFR part 126, and the representation in paragraph (c)(10)(i) of this provision is accurate for the HUBZone small business concern or concerns that are participating in the joint venture. (The offeror shall enter the name or names of the HUBZone small business concern or concerns that are participating in the joint venture: \_\_\_\_\_.) Each HUBZone small business concern participating in the joint venture shall submit a separate signed copy of the HUBZone representation.

(d) Certifications and representations required to implement provisions of Executive Order 11246--

(1) Previous Contracts and Compliance. The offeror represents that--

(i) It ( ) has, ( ) has not, participated in a previous contract or subcontract subject either to the Equal Opportunity clause of this solicitation, the and

(ii) It ( ) has, ( ) has not, filed all required compliance reports.

(2) Affirmative Action Compliance. The offeror represents that--

(i) It ( ) has developed and has on file, ( ) has not developed and does not have on file, at each establishment, affirmative action programs required by rules and regulations of the Secretary of Labor (41 CFR Subparts 60-1 and 60-2), or

(ii) It ( ) has not previously had contracts subject to the written affirmative action programs requirement of the rules and regulations of the Secretary of Labor.

(e) Certification Regarding Payments to Influence Federal Transactions (31 U.S.C. 1352). (Applies only if the contract is expected to exceed \$100,000.) By submission of its offer, the offeror certifies to the best of its knowledge and belief that no Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress or an employee of a Member of Congress on his or her behalf in connection with the award of any resultant contract.

(f) Buy American Act Certificate. (Applies only if the clause at Federal Acquisition Regulation (FAR) 52.225-1, Buy American Act --Supplies, is included in this solicitation.)

(1) The offeror certifies that each end product, except those listed in paragraph (f)(2) of this provision, is a domestic end product and that the offeror has considered components of unknown origin to have been mined, produced, or manufactured outside the United States. The offeror shall list as foreign end products those end products

manufactured in the United States that do not qualify as domestic end products. The terms "component," "domestic end product," "end product," "foreign end product," and "United States" are defined in the clause of this solicitation entitled "Buy American Act--Supplies."

(2) Foreign End Products:

Line Item No.:-----

Country of Origin:-----

(List as necessary)

(3) The Government will evaluate offers in accordance with the policies and procedures of FAR Part 25.

(g)(1) *Buy American Act-Free Trade Agreements-Israeli Trade Act Certificate*. (Applies only if the clause at FAR 52.225-3, Buy American Act-Free Trade Agreements-Israeli Trade Act, is included in this solicitation.)

(i) The offeror certifies that each end product, except those listed in paragraph (g)(1)(ii) or (g)(1)(iii) of this provision, is a domestic end product and that the offeror has considered components of unknown origin to have been mined, produced, or manufactured outside the United States. The terms "component," "domestic end product," "end product," "foreign end product," and "United States" are defined in the clause of this solicitation entitled "Buy American Act-Free Trade Agreements-Israeli Trade Act."

(ii) The offeror certifies that the following supplies are end products of Australia, Canada, Chile, Mexico, or Singapore, or Israeli end products as defined in the clause of this solicitation entitled "Buy American Act-Free Trade Agreements-Israeli Trade Act":

End Products of Australia, Canada, Chile, Mexico, or Singapore or Israeli End Products:

Line Item No.	Country of Origin
----- —	----- —
----- —	----- —
----- —	----- —

[List as necessary]

(iii) The offeror shall list those supplies that are foreign end products (other than those listed in paragraph (g)(1)(ii) of this provision) as defined in the clause of this solicitation entitled "Buy American Act-Free Trade Agreements-Israeli Trade Act." The offeror shall list as other foreign end products those end products manufactured in the United States that do not qualify as domestic end products.

Other Foreign End Products:

Line Item No.	Country of Origin
----- —	----- —
----- —	----- —

—	—
—	—

[List as necessary]

(iv) The Government will evaluate offers in accordance with the policies and procedures of FAR Part 25.

(2) *Buy American Act-Free Trade Agreements-Israeli Trade Act Certificate, Alternate I (Jan 2004)*. If Alternate I to the clause at FAR 52.225-3 is included in this solicitation, substitute the following paragraph (g)(1)(ii) for paragraph (g)(1)(ii) of the basic provision:

(g)(1)(ii) The offeror certifies that the following supplies are Canadian end products as defined in the clause of this solicitation entitled "Buy American Act-Free Trade Agreements-Israeli Trade Act":

Canadian End Products:

Line Item No.
—
—
—
—

[List as necessary]

(3) *Buy American Act-Free Trade Agreements-Israeli Trade Act Certificate, Alternate II (Jan 2004)*. If Alternate II to the clause at FAR 52.225-3 is included in this solicitation, substitute the following paragraph (g)(1)(ii) for paragraph (g)(1)(ii) of the basic provision:

(g)(1)(ii) The offeror certifies that the following supplies are Canadian end products or Israeli end products as defined in the clause of this solicitation entitled "Buy American Act-Free Trade Agreements-Israeli Trade Act":

Canadian or Israeli End Products:

Line Item No.	Country of Origin
—	—
—	—
—	—

[List as necessary]

(4) Trade Agreements Certificate. (Applies only if the clause at FAR 52.225-5, Trade Agreements, is included in this solicitation.)

(i) The offeror certifies that each end product, except those listed in paragraph (g)(4)(ii) of this provision, is a U.S.-made or designated country end product, as defined in the clause of this solicitation entitled "Trade Agreements."

(ii) The offeror shall list as other end products those end products that are not U.S.-made or designated country end products.

Other End Products:

Line Item No.	Country of Origin
_____	_____
—	—
_____	_____
—	—
_____	_____
—	—

[List as necessary]

(iii) The Government will evaluate offers in accordance with the policies and procedures of FAR Part 25. For line items covered by the WTO GPA, the Government will evaluate offers of U.S.-made or designated country end products without regard to the restrictions of the Buy American Act. The Government will consider for award only offers of U.S.-made or designated country end products unless the Contracting Officer determines that there are no offers for such products or that the offers for such products are insufficient to fulfill the requirements of the solicitation.

(h) Certification Regarding Debarment, Suspension or Ineligibility for Award (Executive Order 12549). The offeror certifies, to the best of its knowledge and belief, that --

(1) The offeror and/or any of its principals ( ) are, ( ) are not presently debarred, suspended, proposed for debarment, or declared ineligible for the award of contracts by any Federal agency, and

(2) ( ) Have, ( ) have not, within a three-year period preceding this offer, been convicted of or had a civil judgment rendered against them for: commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a Federal, state or local government contract or subcontract; violation of Federal or state antitrust statutes relating to the submission of offers; or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, tax evasion, or receiving stolen property; and

(3) ( ) are, ( ) are not presently indicted for, or otherwise criminally or civilly charged by a Government entity with, commission of any of these offenses.

(i) Certification Regarding Knowledge of Child Labor for Listed End Products (Executive Order 13126). [The Contracting Officer must list in paragraph (i)(1) any end products being acquired under this solicitation that are included in the List of Products Requiring Contractor Certification as to Forced or Indentured Child Labor, unless excluded at 22.1503(b).]

(1) Listed End Product

Listed End Product	??	Listed Countries of Origin:
??	??	
??	??	
??	??	

(2) Certification. [If the Contracting Officer has identified end products and countries of origin in paragraph (i)(1) of this provision, then the offeror must certify to either (i)(2)(i) or (i)(2)(ii) by checking the appropriate block.]

( ) (i) The offeror will not supply any end product listed in paragraph (i)(1) of this provision that was mined, produced, or manufactured in the corresponding country as listed for that product.

( ) (ii) The offeror may supply an end product listed in paragraph (i)(1) of this provision that was mined, produced, or manufactured in the corresponding country as listed for that product. The offeror certifies that it has made a good faith effort to determine whether forced or indentured child labor was used to mine, produce, or manufacture any such end product furnished under this contract. On the basis of those efforts, the offeror certifies that it is not aware of any such use of child labor.

(j)(1) Annual Representations and Certifications. Any changes provided by the offeror in paragraph (j) of this provision do not automatically change the representations and certifications posted on the Online Representations and Certifications Application (ORCA) website.

(2) The offeror has completed the annual representations and certifications electronically via the ORCA website at <http://orca.bpn.gov>. After reviewing the ORCA database information, the offeror verifies by submission of this offer that the representations and certifications currently posted electronically at FAR 52.212-3, Offeror Representations and Certifications--Commercial Items, have been entered or updated in the last 12 months, are current, accurate, complete, and applicable to this solicitation (including the business size standard applicable to the NAICS code referenced for this solicitation), as of the date of this offer and are incorporated in this offer by reference (see FAR 4.1201), except for paragraphs \_\_\_\_

(Offeror to identify the applicable paragraphs at (b) through (i) of this provision that the offeror has completed for the purposes of this solicitation only, if any.)

These amended representation(s) and/or certification(s) are also incorporated in this offer and are current, accurate, and complete as of the date of this offer.

Any changes provided by the offeror are applicable to this solicitation only, and do not result in an update to the representations and certifications posted on ORCA.)

(End of provision)

## Section L - Instructions, Conditions and Notices to Bidders

## CLAUSES INCORPORATED BY REFERENCE

52.212-1	Instructions to Offerors--Commercial Items	JAN 2005
52.212-4	Contract Terms and Conditions--Commercial Items	OCT 2003
52.215-20	Requirements for Cost or Pricing Data or Information Other Than Cost or Pricing Data	OCT 1997

**SECTION L PROPOSAL REQUIREMENTS****L GENERAL INSTRUCTIONS**

The Government intends to award a single contract as a result of this solicitation. Each Offeror shall submit a proposal that clearly and concisely describes and defines the contractor's response to the requirements contained in the RFP. Use of general or vague statements such as "standard procedures will be used" will not satisfy this requirement. Unnecessary elaboration or other presentations beyond that sufficient to present a complete and effective proposal are not desired and may be construed as an indication of the Offeror's lack of understanding or cost consciousness. Elaborate artwork, expensive paper or bindings, and expensive visual or other presentation aids are neither necessary nor desired.

The Offeror shall not repeat information required in the responses in two or more proposal data requirements. Such information shall be presented in detail in the one area of the proposal where it contributes most critically to the discussion of the data requirement. In other areas where discussion of the same information is necessary, the Offeror shall refer to the initial discussion and identify its location within his proposal.

The proposal shall contain all the pertinent information in sufficient detail to permit evaluation of the proposal. This shall include cross-referencing for traceability. **The proposal shall not contain Hyperlinks.**

Each Offeror must submit an offer/proposal and other written information in strict accordance with these instructions.

When evaluating an Offeror, the Government will consider how well the Offeror complied with both the letter and spirit of these instructions. The Government will consider any failure on the part of an Offeror to comply with both the letter and spirit of these instructions to be an indication of the type of conduct it can expect during contract performance. Therefore, the Government encourages Offerors to contact the Contracting Officer by telephone, facsimile transmission, mail, or e-mail in order to request an explanation of any aspect of these instructions.

Each Offeror shall submit the information required by Offer/Proposal Submission, Offeror Capability Information, and Cost and Price Information.

**A. Offer/Proposal Submission**

The RFP includes the potential (or model) task order or proposal consisting of:

**Volume I - Offer/Proposal**

- ?? Prices or costs and fees inserted by the Offeror
- ?? Consent and agreement to the Statement of Work and all clauses applicable to each section. All clauses shall be filled in appropriately by the Offeror.
- ?? Acknowledgement of Clause HQ-L-2-0005 - Notification of Potential Organization Conflict(s) of Interest (NAVSEA)(JUN 1994). See paragraph (e) requirement.

These items constitute the Offeror's assent to the terms of the RFP and the Offeror's proposal prices or estimated cost and fee. By submitting these items, a promise is made by the Offeror to accede to the terms and conditions of the RFP and complete the specified work in accordance with those terms and conditions.

**Volume II – Offeror Capability Information**

- ?? Ability of the Proposed Commercial Item to Meet the Government's Requirements (not to exceed 15 pages)
- ?? Relevant Experience Matrix and Supportive Narrative (not to exceed 15 pages)
- ?? Past Performance Matrix
- ?? Section K completed by the Offeror

**Volume III – Cost and Price Information**

- ?? Cost and Pricing Information

**B. Offeror Capability Information - Volume II**

**(1) Ability of the Proposed Commercial Item to Meet the Government's Requirements**

The Offeror shall provide a comprehensive technical description of their commercial item and its operation. The Offeror shall explain how the item will meet the Government's requirements as detailed in the Government provided Statement of Work (SOW). The Offeror shall discuss any alternative/innovative approaches they intend to pursue in complying with the SOW requirements. The Offeror shall identify any active patents and proprietary procedures or processes, and why they are essential. A graph plotting the proposed system's tracking filter characteristics shall be provided. The description and explanation shall not exceed a total of 15 pages and may include, as appropriate, supplemental drawings, sketches, diagrams, and/or tables. The Offeror's technical description shall specifically address the following:

1. The Offeror shall describe a step-by-step procedure for executing a test setup for standard multi-shaker vibration testing. Include a description of parameters monitored, and the screen display during test execution.
2. The Offeror shall describe the process for controlling amplitude, phase, and coherence during MIMO sine and random vibration testing.
3. The Offeror shall describe the method that the impedance matrix will use for updating during each control cycle to account for dynamic changes in the item under test and describe how this could be displayed on the screen to verify a change in the impedance matrix.
4. The Offeror shall describe the number and types of real-time displays that will be available during vibration testing.
5. The Offeror shall describe the use of true digital tracking filters and how these are important for single and multi-shaker sine vibration control.
6. The Offeror shall describe the importance of accounting for singularities during multi-shaker testing and how they are addressed.
7. The Offeror shall describe how they could use active limit channels, which are not used as control channels, to adjust the input levels so the limit assigned is not exceeded.

8. The Offeror shall describe the data available for post-test viewing of vibration testing and transient shock testing. Describe the post-test graphs/plots available for viewing and output.
9. The Offeror shall describe the proposed system's process for equalization of shaker table signals before full test level execution.
10. The Offeror shall describe the proposed system's process for executing an automatic abort. Include the conditions monitored, and the causes that may prompt an automatic abort and how they are reported.

## **(2) Relevant Experience**

*Experience* is the opportunity to learn by doing. The Offeror shall provide evidence that demonstrates, during the past three (3) years, the opportunity to learn as a business entity about relevant work processes and procedures and about the nature, difficulties, uncertainties and risks associated with performing the kind of work that will be required under the prospective task order. The Offeror shall identify Federal, state and local governments, and private contracts, (contract #, technical point of contact and address/telephone number) performed by them within the past three (3) years that were similar in nature to the requirements of this RFP. This shall include a list of all first tier subcontractors for each prime contract reference, and the name of their customer's customer for each subcontract reference.

The information shall be submitted on the *Relevant Experience Matrix (as listed in Section J)*. A supportive narrative, as to the benefits gained from each contract/subcontract reference identified for the prime and proposed subcontractor shall be included with the Matrix. This should be a summary of the Offeror's relevant experience in each of the SOW task areas and shall discuss the direct relevancy to the SOW task areas. It shall not parrot the SOW task descriptions, as that is ineffective in supporting the Offeror's claim of having gained relevant experience in the given task area. **The narrative shall not exceed 15 pages in total.** The Offeror may also provide information on problems encountered on the identified contracts and the corrective actions taken.

*The Offeror will not attribute to its experience, the individual experience of its current or prospective employees.*

The Offeror shall also specify to what extent subcontractors were involved in gaining related corporate experience, and their level of involvement with respect to scope of work, objective achieved, personnel resources utilized, and how previous contracts relate to tasking under this effort.

## **(3) Past Performance**

Past Performance is a measure of the degree to which an Offeror, as an organization, has during the past three (3) years: (1) satisfied its customers, and (2) complied with federal, state, local laws and regulations. The Offeror shall provide a list of references using the *Past Performance Matrix, (as listed in Section J)*, who will be able to provide information regarding the Offeror's past performance during the past three (3) years regarding: (1) customer satisfaction; (2) timeliness; (3) technical success; (4) program management; (5) and quality.

The Offeror will submit the *Past Performance Questionnaire (as listed in Section J)* to each of the references listed on the Past Performance Matrix, a minimum of three (3) is required. The Offeror shall instruct the references to complete the Past Performance Questionnaire and return it by no later than the closing date of the solicitation directly to:

Naval Surface Warfare Center  
101 Strauss Ave, Bldg. 1558  
Indian Head, MD 20640-5035  
Attn: Kay Proctor, Code 111W

Fax: (301)744-6546

Email: kay.proctor@navy.mil

Completed Past Performance Questionnaires may be mailed, faxed or emailed to the Contract Specialist.

The Offerors selected references must be listed on the Past Performance Matrix. **Failure of the references to submit Past Performance Questionnaire to the Contract Specialist by the Closing Date of the Solicitation may result in inability of the Government to rank the Offerors past performance and may affect the overall Level Of Confidence Assessment Rating (LOCAR) of the Offeror's capability. It is the Offeror's responsibility to ensure that references respond within the required timeframe.**

In the investigation of an Offeror's past performance, the Government has the right to contact former customers and Government agencies, and other private and public sources of information.

Offerors must either provide the above information or affirmatively state that it possesses no relevant, directly related, or similar past performance.

NOTE: PAST PERFORMANCE INFORMATIONAL & QUESTIONNAIRE SHEETS ARE ATTACHMENTS TO THE SOLICITATION, AS LISTED IN SECTION J.

### **C. Cost and Price Information - Volume III**

The price proposal shall include the completed solicitation document and any available pricing information to facilitate the price analysis that will be performed in evaluating the proposal (i.e., cost breakdown, catalog pricing, past pricing history, etc.).

It is recommended that Offeror's utilize this Offer Submission Checklist to ensure that all requested information is provided in response to this RFP.

**FACTOR: OFFER/PROPOSAL SUBMISSION****Volume I – Offer/Proposal:**

- \_\_\_\_\_ Prices or costs and fees inserted by the Offeror
- \_\_\_\_\_ Consent and agreement to the Statement of Work and all clauses applicable to each section. All clauses shall be filled in appropriately by the Offeror
- \_\_\_\_\_ Acknowledgement of Clause HQ-L-2-0005 – Notification of Potential Organization Conflict(s) of Interest (NAVSEA)(JUN 1994). See paragraph (e) requirement.

**Volume II – Offeror Capability Information:**

- \_\_\_\_\_ Ability of the Proposed Commercial Item to Meet the Government's Requirements (not to exceed 15 pages)
- \_\_\_\_\_ Relevant Experience Matrix and Supportive Narrative (not to exceed 15 pages)
- \_\_\_\_\_ Past Performance Matrix
- \_\_\_\_\_ Section K completed by the Offeror

**Volume III – Cost and Price Information:**

- \_\_\_\_\_ Price Proposal
- ?? Completed Section B of Solicitation document
- ?? Any available pricing information to facilitate the price analysis

## Section M - Evaluation Factors for Award

## CLAUSES INCORPORATED BY FULL TEXT

**52.212-2 EVALUATION--COMMERCIAL ITEMS (JAN 1999)****I GENERAL INFORMATION**

**The Government intends to award a single contract as a result of this solicitation. The Government will award the contract to the Offeror representing the best value using the tradeoff process based on the following factors (in descending order of importance):**

- (1) Offeror Capability
- (2) Price or Estimated Cost and Fee

These evaluation factors are broken into two categories- “offer/proposal” and “capability”.

- a. “Offer/Proposal” factors are those evaluation factors that will become part of the contract if and when it is awarded, hence, the proposal or offer which contains the model contract, inclusive of Sections A through J of the solicitation.
- b. “Capability” factors (i.e., ability of the proposed commercial item to meet the Government’s requirements, relevant experience, and past performance) are those factors that will be used to evaluate the capability of the competing Offerors. The factors DO NOT become part of the contract but they play a key role in the source selection process.

**Source Selection shall be determined using the LOCAR (Level of Confidence Assessment Rating) methodology.**

<b>FACTORS</b>	<b>WEIGHTING</b>
(1) Ability of the Proposed Commercial Item to Meet the Government’s Requirements	Most Important
(2) Relevant Experience	2 <sup>nd</sup> Most Important
(3) Past Performance	3 <sup>rd</sup> Most Important

The Government reserves the right to change any of the terms and conditions of the RFP by amendment at any time prior to contract award and to allow Offerors to revise their offers accordingly, as authorized by FAR 15.206. The Government intends to award the contract on the basis of initial offers received, without discussions. Therefore, each offer/proposal, should contain the Offeror’s best terms from their offer/proposal and cost/price standpoint. However, if considered necessary by the Contracting Officer, discussions will be conducted only with those Offerors determined to have a reasonable chance for award.

Any unauthorized exception or failure will constitute a deficiency (see FAR 15.301). An Offeror may eliminate a deficiency in its offer only through discussions and if permitted by the Government.

Capability Information constitutes “other written information” and is not part of the offer/proposal. Pursuant to FAR 15.306, exchanges of information with the Offeror after receipt of proposals may be permitted.

The Government will assess the extent to which each Offeror complied with the instructions in the RFP. The Government will consider any failure to comply with these instructions to be indicative of the kind of behavior that it could expect during contract performance and a possible lack of capability to perform satisfactorily.

## **A. Offeror Capability Information**

### **(1) Ability of the Proposed Commercial Item to Meet the Government's Requirements**

Based on the Offeror's technical description of their commercial item and its operation, the Government will assess the information provided to determine if the Offeror's proposed commercial item will meet the Government's needs. The Government will evaluate the Offeror's response to the ten (10) technical requirements as specified in Section L. The Government will also assess any proposed alternative/innovative approaches that the Offeror plans to pursue in complying with the Statement of Work (SOW) requirements and evaluate if the Offeror has any active patents and proprietary procedures or processes that they will employ to meet the SOW requirements.

### **(2) Relevant Experience**

*Experience* is the opportunity to learn by doing. The Government will assess each Offeror's work records to determine whether, during the past (3) years, the Offeror has had the opportunity to learn about relevant work processes and procedures and about the nature, difficulties, uncertainties and risks associated with performing the work that will be required under the prospective contract. The Government will try to determine how many opportunities an Offeror has had, as a business entity, to carry out those processes and procedures and to cope with those difficulties and uncertainties. The Government will also assess the Offeror's experience with propagation analysis.

The Government will evaluate the benefits gained from each contract/subcontract reference identified and the Offeror's relevant experience as it relates to each of the SOW task areas and its direct relevancy to the SOW task areas. The Government will assess whether or not the Offeror has simply parroted the SOW task descriptions, or whether distinct, relevant information has been provided.

The Government will not attribute to an Offeror *the individual experience of the Offeror's current or prospective employees*. The Government will also assess to what extent subcontractors were involved in gaining related corporate experience, and their level of involvement with respect to scope of work, objective achieved, and personnel resources utilized, and how previous contracts relate to tasking under this effort.

### **(3) Past Performance**

*Past Performance* is a measure of the degree to which an Offeror, as an organization, has, during the past three (3) years; (1) satisfied its customers, and (2) complied with federal, state, and local laws and regulations. The Government will inquire about: (1) customer satisfaction, (2) timeliness; (3) technical success; (4) program management; and (5) quality. The Offeror's reference information must be current to facilitate the evaluation process.

**Failure of the Offeror's references to respond within the timeframe required may result in the inability of the Government to rank the Offeror's past performance and may effect the overall Level Of Confidence Assessment Rating (LOCAR) of the Offeror's capability. It is the Offeror's responsibility to ensure that references respond within the required timeframe.**

**In the investigation of an Offeror's past performance the Government will contact former customers and Government agencies, and other private and public sources of information.**

Offerors must either provide the information or affirmatively state that it possesses no relevant, directly related, or similar past performance.

## B. COST AND PRICE INFORMATION

**Although price is not the most important evaluation factor. This information can be used to: (1) to verify the Offeror's understanding of the requirements; and (2) to assess the degree to which the cost/price proposal reflects the Offeror's understanding of the work and the resources necessary to perform the work.**

## II. SCORING PROCESS

Each proposal shall be evaluated against the evaluation criteria set forth in the RFP. Proposals shall not be compared to each other during the evaluation process or to any other requirements that are not set forth in the RFP. The Government shall determine the Offeror that represents the best value to the Government using the LOCAR (Level of Confidence Assessment Rating) method. In developing the LOCAR for each Offeror the Government will consider that Offeror's ability of the proposed commercial item to meet the Government's requirements, relevant experience, and past performance. Once the LOCAR for each Offeror is determined the Government will then compare/rank Offerors based on their LOCAR and price, to arrive at a decision as to the offer(s) that represent the best value to the Government utilizing the tradeoff process.

**A. A Level of Confidence Assessment Rating (LOCAR)** will be assigned to each Offeror's capability. The following is the scale for the LOCAR:

**Least Confident (0-49)** (Performance doubtful)

**Less Confident (50-69)** (Less likely to succeed)

**More Confident (70-94)** (More likely to succeed)

**Most Confident (95 - 100)** (Most likely to succeed)

The Government will assign a LOCAR to the capability of each Offeror (including ability of the proposed commercial item to meet the Government's requirements, relevant experience, and past performance). The following Table is an example of the scoring process for the Offeror Capability Evaluation:

**Table 1 - Offeror Capability/LOCAR Determination**

<b>Offeror</b>	<b>Ability of the Proposed Commercial Item to Meet the Government's Requirements</b>	<b>Relevant Experience</b>	<b>Past Performance</b>	<b>LOCAR</b>
A	Excellent	Excellent	Excellent	95
B	Good	Good	Good	80
C	Good	None	Poor	40

## **B. Best Value Tradeoff Analysis**

In order to determine which Offeror represents the best value utilizing the tradeoff process, the Government will make a series of paired comparisons among the Offerors, trading off the differences in the nonprice factors against the difference in most probable price between the Offerors. If, in any paired comparison, of any two Offerors, one Offeror has both a higher LOCAR and the lower price, then that Offeror is the best value. If the Offeror with the higher LOCAR has the higher price, then the Government must decide whether the margin of higher LOCAR (i.e. greater prospects for success) is worth the higher price. The Government will continue to make paired comparisons in this way until an Offeror representing the best value is identified.

**Table 2 – Tradeoff Analysis**

<b>OFFEROR</b>	<b>LOCAR</b>	<b>PROPOSED PRICE</b>	<b>EVALUATED COST</b>
<b>A</b>	<b>95</b>	<b>\$260,000</b>	<b>\$280,000</b>
<b>B</b>	<b>80</b>	<b>\$390,000</b>	<b>\$350,000</b>
<b>C</b>	<b>40</b>	<b>\$460,000</b>	<b>\$400,000</b>

## **C. Single Offeror**

In the event where the Government only receives one acceptable proposal submission, the Government reserves the right to award only if: (1) the Offeror receives a total LOCAR score of 70 or higher and (2) the Offeror's costs are determined to be fair and reasonable for the LOCAR score received. Predicated on the Offeror meeting the specified LOCAR score and determination of costs being fair and reasonable, only then will the Offeror be eligible for award.

## **D. Pre-Award Site Visit**

Prior to award the Government reserves the right to conduct a Pre-Award Site Visit at the Offeror's facility.